Toward a better understanding of what makes positive psychology interventions work : predicting happiness and depression from the person × intervention fit in a follow-up after 3.5 years

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Toward a Better Understanding of What Makes Positive Interventions Work: Predicting Happiness and Depression From the Person × Intervention-fit in a Follow-Up After 3.5 Years

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Abstract

Toward a Better Understanding of What Makes Positive Interventions Work:

Predicting Happiness and Depression From the Person × Intervention-fit

in a Follow-Up After 3.5 Years

Background. Robust evidence exists that positive psychology interventions are effective in enhancing well-being and ameliorating depression. Comparatively little is known about the conditions under which they work best. Models describing characteristics that impact the effectiveness of positive interventions typically contain features of the person, of the activity, and the fit between the two. This study focuses on indicators of the person × intervention-fit in predicting happiness and depressive symptoms 3.5 years after completion of the intervention.

Methods. A sample of 165 female adults completed measures for happiness and depressive symptoms before and about 3.5 years after completion of a positive intervention (random assignment to one out of nine interventions, which were aggregated for the analyses). Four fit-indicators were assessed: Preference; continued practice; effort; and early reactivity.

Results. Three out of four person × intervention-fit indicators were positively related to happiness or negatively related to depression when controlled for the pretest scores. Together, they explained 6% of the variance in happiness, and 10% of the variance of depressive symptoms.

Conclusions. Most tested indicators of a person × intervention-fit are robust predictors of happiness and depressive symptoms—even after 3.5 years. They might serve for an early estimation of the effectiveness of a positive intervention.

Keywords: depression, happiness, person × intervention-fit, positive psychology, positive psychology interventions, well-being

Introduction

Background

Positive Psychology is the scientific study of what makes people's life most worth living (Seligman & Csikszentmihaly, 2000). One of its central aims is the development and evaluation of positive psychology *interventions*; i.e., "[…] treatment methods or intentional activities that aim to cultivate positive feelings, behaviors, or cognitions" (Sin & Lyubomirsky, 2009; p. 468). Sin and Lyubomirsky (2009) identified 51 interventions that fit this definition in their meta-analysis and concluded that they are effective in increasing well-being and decreasing depression (see also Bolier, Haverman, Westerhof, Riper, Smit, & Bohlmeijer, 2013). Hence, there is strong evidence for the effectiveness of this type of intervention, but the question arises under which *conditions* they work best. This research question can be studied best by examining long-term effects on happiness and depression in participants who have (actively) completed a positive intervention in the past.

A theoretical framework guiding such a study is Lyubomirsky and Layous' (2013) *positive-activity model,* which describes components that contribute to the effectiveness of positive psychology interventions. Lyubomirsky and Layous argue that the increase in well-being due to a positive activity (a self-administered and brief positive psychology intervention) is moderated by three different features: (a) Features of the *activity* itself (e.g., its *dosage* [i.e., the frequency and duration of the performance of a positive intervention], or its *variety* [i.e., the variation in the practices of a positive intervention]; see also Sheldon & Lyubomirsky, 2012); (b) features of the *person* (i.e., general characteristics, such as demographics, personality, baseline levels of well-being, general motivation, etc.); and (c) the "fit" between the activity and the person (i.e., the extent to which the intervention matches an individual's preferences and characteristics; the interaction between the features of the activity and the person). This model not only helps describe the relevant components that

might have an impact on the effectiveness of an intervention, but can also be used for selecting components that can be tested empirically.

The main aim of the present study was testing the contribution of selected components that contribute to the effectiveness of positive psychology interventions by analyzing their potential to predict happiness and depression about 3.5 years after the assigned intervention has been completed. Unlike other studies that have their main emphasis on the fit of an intervention with personality variables (e.g., Giannopoulos & Vella-Brodrick, 2011; Senf & Liau, 2012), and that test the influence of "fit" directly, we pursued an indirect approach and focused on outcomes that could be seen as indicative of a person × intervention-fit; i.e., how people *perceive* (e.g., like) the interventions, how they *work* with them (e.g., investing more time, or continuing to practice above and beyond the designated time frame), and how they *react* to them (e.g., showing a quick response to the interventions). Hence, in the framework of this study examples like investing more time for the intervention, or showing a quick response in the sense of an increase in happiness and/or amelioration of depression would be seen as indicators of a good fit between the person and the intervention.

We selected four indicators of the person × intervention-fit that could be tested in a sample of participants who had taken part in a self-administered online study earlier (Gander, Proyer, Ruch, & Wyss, 2013; while the study was published in 2013, the data was collected starting in 2009) and that were invited to complete the same measures for the dependent variables (happiness and depression) again. The study by Gander and colleagues (2013) is a replication and extension of Seligman, Steen, Park, and Peterson (2005), who tested positive interventions in an online-setting. They found that three positive psychology interventions (i.e., *gratitude visit*, *three good things*, and *using signature strengths in a new way*) were effective in increasing happiness and ameliorating depression for up to six months after the intervention in comparison to a placebo control condition (i.e., *early memories*). Gander et al. (2013) replicated these findings and, additionally, tested the effects of three variants of these

interventions (i.e., three good things during two weeks, combining three good things [first week] and gratitude visit [second week], and replacing three *good* things by three *funny* things; see Proyer, Gander, Wellenzohn, & Ruch, in press, and Ruch & McGhee, 2014), and three interventions that had not been empirically tested in an online setting previously (i.e., *counting kindness*; *one door closes, another door opens*; and *gift of time*). All of these interventions led to an increase in happiness or a decrease in depressive symptoms—at least at one point in time in the period tested (Gander et al., 2013).

Building up on the framework by Lyubomirsky and Layous (2013), we evaluate the contribution of four indicators of a person × intervention fit to the prediction of happiness and depression about 3.5 years after completion of a positive psychology intervention; i.e., the *preference* for specific activities, the *voluntary continuation of practice*, *effort*, and *early reactivity* (i.e., a rapid increase in positive emotions after starting practicing).

Preference

The most straightforward indicator of a person × intervention-fit is probably asking the participants whether they *liked* the intervention or not and whether they think they have personally *benefited* from their participation. Schueller (2010) compared six positive psychology interventions (i.e., active-constructive responding, three good things ["blessings exercise"], gratitude visit, life summary, savoring, and using signature strengths in a new way) and examined the effects of individual preferences for certain exercises (i.e., a composite score of liking the exercise, reporting a subjective benefit from the exercise, and the perceived difficulty of the exercise) on the effectiveness of the intervention; i.e., increases in happiness and decreases in depressive symptoms. He found a positive relation between the preference for an exercise and the effectiveness of the intervention for all interventions tested except for the savoring-condition.

We assessed the preference for the intervention by asking participants (immediately after the completion of the intervention) whether they liked it and whether they had the

impression of having benefited from the intervention. We expected greater liking and a perceived benefit to be positively related with individual levels of happiness and negatively with depressive symptoms 3.5 years after completion of the intervention.

Continued practice

One might argue that participants who can positively relate to the intervention they were assigned to (high person × intervention fit) are more likely to *voluntarily* continue practicing beyond the instructed time period than those that participate in an intervention that does not fit. Lyubomirsky, Sheldon, and Schkade (2005) suggest that continued practice facilitates the development of a habit, which enables maintaining the increased level of well-being. This suggestion is very much in line with early works by James (1899), but has also received further support in empirical studies. For example, Seligman et al. (2005) found larger increases in happiness (and larger decreases in depressive symptoms) for those participants who voluntarily continued practicing beyond the instructed time period in comparison to those that stopped practicing. These differences were observable for time periods of up to six months for happiness and for up to one month for depressive symptoms. Gander et al. (2013) reported similar findings with a parallel design. Effects could be replicated for happiness for up to six months, while continued practice did not have effects on depressive symptoms in this study. Sheldon and Lyubomirsky (2006) examined two positive psychology interventions (i.e., best possible self, and a gratitude exercise) and reported stronger effects on positive affect for up to six months (and a trend towards stronger effects on [lower] negative affect) for participants who continued with the exercise. Cohn and Fredrickson (2010) reported that participants who continued practicing an intervention (*loving kindness meditation*) reported more positive emotions at a follow up after 15 months than non-continuers (see also Seear & Vella-Brodrick, 2013).

Overall, there is robust evidence that participants who continue practicing above and beyond the instructed time period report greater increases in well-being in positive

interventions than those who do not. There is also data that helps differentiate between *voluntary* continued practice and the effects of a prolonged *instructed* training phase. Gander et al. (2013) compared the effects for a one- and a two-week instructed practice condition of the three good things-intervention. There were no positive effects for the interventions due to the prolongation of the instruction. These findings give hints for the notion that voluntary continuation of practice might be more effective than instructed continuation. However, this has not been shown for other types of interventions so far.

For the present study, data from Gander et al. (2013) on continued practice was available for each follow-up (1, 3, and 6 months). We hypothesized that the longer the participants continued practicing voluntarily, the higher their levels of happiness and the lower their depressive symptoms would be after 3.5 years.

Effort[1]

Previous research on goal striving has shown that people put more effort into the pursuit of goals, which fit their interests and values (Sheldon & Elliot, 1999). One might further argue that a good fit between the intervention and the person facilitates effort. Lyubomirsky, Dickerhoof, Boehm, and Sheldon (2011) put special focus on the relation between effort and changes in well-being (i.e., a composite of life satisfaction, happiness, pleasant affect, and unpleasant affect) in two intervention conditions (expressing optimism and expressing gratitude) and in comparison with a placebo control condition. Two raters read the participants' productions in the writing exercises and provided ratings on how much energy and effort the participants invested in the exercise. Lyubomirsky et al. (2011) found a positive relation between an increase in well-being and the amount of effort participants invested in the assigned exercises, but only in the intervention conditions and not in the placebo control condition. Cohn and Fredrickson (2010) also found a positive relation

[1] *Effort* refers to the performance in a specific intervention and *not* to a general personality characteristic or person feature*;* see, e.g., the positive-activity model by Lyubomirsky and Layous (2013).

between the amount of time participants spent with the intervention (i.e., the amount of time spent meditating per day) and well-being.

In the present study, we assessed two different aspects of effort: Firstly, we asked participants after completion of the designated time for conducting the respective activity whether they did as much as required in the instruction, or whether they did more or less (*effort—instruction*). Secondly, we asked how much time they had spent with the exercise during the intervention week in total; participants were required to give an estimate in minutes (*effort—time*). We expected a positive relation between both aspects of effort and the happiness-scores after 3.5 years, and a negative relation for depressive symptoms.

Early Reactivity

Cohn and Fredrickson (2010) report that *early reactivity* (i.e., a rapid increase in positive emotions due to an intervention) predicted continued practice in their study. The authors concluded that early reactivity might be an indicator of a good person × intervention-fit. Based on these results, it was hypothesized that early reactivity also predicts long-term increases in well-being. We expected that the increase in happiness (and the decrease in depressive symptoms, respectively) in the intervention week would be positively related to happiness and negatively related to depressive symptoms after 3.5 years.

Aims

Earlier studies found effects in the expected direction for those indicators of the person × intervention-fit that were mentioned earlier for up to six months after the intervention (e.g., Gander et al., 2013; Lyubomirsky et al., 2005; Seligman et al., 2005). While this is a comparatively long time-span (e.g., in the meta-analysis by Bolier et al. [2013] only 10 out of 39 studies conducted a follow-up after 3 *months* or more), even longer periods of time seem relevant when thinking of sustainable changes. To the best knowledge of the authors, there is no study of positive psychology interventions that tested long-term effects beyond 15 months after completion of the intervention (Cohn & Fredrickson, 2010). Additionally, it needs

mentioning that most of the studies in this field examined the effects of a small subset of indicators only (e.g., Cohn & Fredrickson, 2010; Schueller, 2010; Sheldon & Lyubomirsky, 2006). Thus, it is unclear whether the studied indicators are independent or whether they influence each other; Cohn and Fredrickson (2010) reported that continued practice is predicted by early reactivity – this could also be the case for other indicators. For example, those who like the exercise could be those who invest more effort and therefore report early reactivity. Thus, testing several indicators simultaneously provides information on their relative importance and their relations, which might lead to different conclusions and implications for practice.

The main aim of the present study was testing the respective contribution of different indicators of a person × intervention-fit in the prediction of happiness and depressive symptoms. For this purpose, we applied a longitudinal design using a 3.5-year follow-up after the completion of a positive psychology intervention.

Method

Participants

All participants who completed the study by Gander et al. (2013; $N = 622$) were contacted again about 3.5 years after completion of the positive psychology intervention. Of these, $n = 165$ participants (22 to 71 years; $M = 46.14$, $SD = 8.84$) completed the follow-up. They were rather well educated; about half of them (50.9%) held a degree from a university or a university of applied sciences, 23.6% had a diploma allowing them to attend a university, and 25.5% had a completed vocational training. About half of the sample was married or in a registered partnership (50.3%), 17% were in a relationship, 19.4% were single, 12.7% were divorced or lived separated from their partner, and one participant was widowed.

If comparing those participants who completed the follow-up after 3.5 years with those that did not ($n = 394$; excluding male participants, see below), we found that age differences approached significance and the former group tended to be older ($F[1, 557] =$

3.69, $p = .06$), but there were no differences regarding educational level ($F[1, 557] = 0.34$, $p = .56$), marital status ($\chi^2[5, N = 559] = 4.59$, $p = .47$), or baseline scores in happiness ($F[1, 557] = 1.31$, $p = .25$) and depressive symptoms, $F(1, 557) = 0.03$, $p = .87$. Also, there was no difference among the intervention conditions regarding the number of participants who completed the follow-up, $\chi^2(8, N = 559) = 6.37$, $p = .61$.

Instruments

The *Authentic Happiness Inventory* (AHI; Seligman et al., 2005) is a self-rating questionnaire for the assessment of an individual's feelings of happiness in the past week. Each item consists of five statements (e.g., *I have sorrow in my life* to *My life is filled with joy*). The AHI was designed for covering upward changes in happiness (Seligman et al., 2005). A broad range of studies supports the validity of the AHI (e.g., Mongrain & Anselmo-Matthews, 2012; Schiffrin & Nelson, 2010), also in its German version (e.g., Proyer, Gander, Wellenzohn, & Ruch, in press; Ruch, Proyer, Harzer, Park, Peterson, & Seligman, 2010). Gander et al. (2013) used a 33-item version of the AHI, but for the follow-up assessment after 3.5 years, a newer and revised version with 24-items was used. We based all analyses on those 19 items that overlap between the two versions. However, the shorter and longer versions were almost identical; they converged with $r = .98$ using the data from the Gander et al. (2013)-study. Internal consistencies of the 19 items of the AHI were $\alpha = .91$ at pretest, and $\alpha = .92$ at the follow-up after 3.5 years.

The *Center for Epidemiologic Studies Depression Scale* (CES-D; Radloff, 1977; in the German adaption by Hautzinger & Bailer, 1993) is a 20-item measure for the subjective assessment of the frequency and duration of depressive symptoms in the past week. Answers are given on a 4-point scale ranging from 0 (*Rarely or none of the time [Less than 1 day]*) to 3 (*Most or all of the time [5-7 days]*). A sample item is "I felt depressed". The CES-D is frequently used in research (for an overview see Shafer, 2006). Internal consistencies were $\alpha = .92$ at pretest, and $\alpha = .91$ at the follow-up after 3.5 years.

Indicators of a person × intervention-fit. Upon completion of the intervention, participants provided ratings for several questions on the person × intervention-fit; i.e., (a) how they liked the exercise (*preference–liking*; from 1 = *not at all* to 7 = *very much*); and (b) a subjective rating on whether they saw a personal benefit from the exercise and if so how high they perceived the benefit (*preference–benefit*; from 1 = *No, not at all* to 5 = *Yes, very high*); (c) whether they conducted the assigned exercise as instructed (*effort–instruction*; 0 = *I did less than instructed*, 1 = *I did it as instructed [or more]*); (d) how much time they invested in the exercise during the intervention week (*effort–time*; from 1 = *less than five minutes* to 8 = *more than two hours*). Participants were also asked at the 1-, 3-, and 6-months follow-ups whether they continued their exercise above and beyond the instructed time period of one week (e). This allowed computing a score for how long they conducted the assigned exercise (*continuation*; 1 = *only during the intervention week*; 2 = *up to one month*; 3 = *up to three months*; and 4 = *up to six months*). Finally, we measured *early reactivity* (f) by assessing the change in happiness and depressive symptoms from the pretest to the (immediate, i.e., directly after the intervention week) posttest.

Procedure

In the study by Gander et al. (2013), participants were randomly assigned to one of nine positive intervention conditions (i.e., *gratitude visit*, *three good things*, *using signature strengths in a new way*, *three good things—during two weeks*, *gratitude visit & three good things combined*, *three funny things*, *counting kindness*, *gift of time*, and *another door opens*) or a placebo control condition (i.e., *early memories*). A full description of the interventions is given in Gander et al. (2013). All interventions lasted one week (except for three good things which lasted two weeks, and the combination of three good things and gratitude visit). The participants completed the AHI and the CES-D at five points of measurement (pretest, posttest, 1-, 3-, and 6-months follow-up). At the posttest and follow-ups, they also completed questions on the indicators of a person × intervention-fit.

All participants who started their assigned intervention and completed all follow-ups in the study by Gander et al. (2013) were invited via email to participate in the present study. For this long-term follow-up, participants completed the AHI (Seligman et al., 2005) and the CES-D (Radloff, 1977) online on a website affiliated with an institute of higher education in the German-speaking part of Switzerland. All participants gave informed consent before the data collection started. Data collection for the follow-up in the present study started about 3.5 years after the intervention-week and lasted for about half a year (the completion time ranged from 3.63 years to 4.28 years after the intervention-week). However, most of the participants completed the follow-up shortly after the beginning of the data collection. On average, participants completed the follow-up 3.74 years after completion of the assigned intervention (SD = 0.14 years; Mdn = 3.68 years). For the sake of simplicity, we refer to this follow-up as the *3.5-years* follow-up.

Since only few male participants (n = 9) took part in the follow-up after 3.5 years, and sample sizes in the placebo control condition (n = 17) were too small for comparisons between the intervention and the placebo control condition, we based all our analyses on female participants in the intervention conditions[2]. We aggregated all interventions since we were interested in indicators of a person × intervention-fit that *generally* affect long-term outcomes, regardless of the type of the positive intervention the participants conducted. Additionally, the sample sizes were too small for a comparison of individual interventions (sample sizes ranged from n = 12 for the *one door closes, another door opens*- to n = 28 for the *three good things*-intervention). Since all intervention conditions shared a common pattern (i.e., all were self-administered by the participants and aimed at increasing positive emotions, cognitions, and experiences in order to increase happiness and ameliorate

[2] We also analyzed whether the well-being scores at the long-term follow-up differed between the intervention condition and the placebo control condition (when controlled for the pretest scores). As expected, there were no differences for happiness (F[1, 179) = 0.14, p = .71) or depressive symptoms, F(1, 179) = 0.25, p = .62.

depressive symptoms) and earlier meta-analyses (Bolier et al., 2013; Sin & Lyubomirsky, 2009) found moderating factors (such as intervention format or -duration) to be relevant *across* positive intervention types, we expected the indicators of a person × intervention-fit to play a similar role in all interventions.

Results

We first computed the zero-order correlation coefficients among all variables that entered the study. This allowed a first evaluation of their associations (see Table 1).

Insert Table 1 about here

Table 1 shows the expected pattern for happiness and depressive symptoms. For both, the pretest scores had a robust positive association with the respective scores after 3.5 years. The convergence of the two measurement time points, reflected in the correlation coefficients, was higher for the AHI than for the CES-D ($z = 5.33$, $p < .001$; Raghunathan, Rosenthal, & Rubin, 1996).

Both indicators of preference (liking and personal benefit) for the interventions correlated positively with happiness at both measurement periods (i.e., pretest and 3.5 year follow-up), and continued practice was associated with happiness at the follow-up after 3.5 years. Only one indicator of self-rated effort (completion of the intervention as instructed) yielded a relationship with happiness at the 3.5-year follow-up. The other indicator of effort, the time spent for conducting the exercise, was unrelated to happiness or depressive symptoms at both time points. Early reactivity in *happiness* was related to the happiness scores at pretest and early reactivity in *depressive symptoms* was associated with happiness and depressive symptoms at the pretest. Finally, there were moderate correlations among the indicators of a person × intervention-fit. This suggests that they converged well without being redundant.

Predicting happiness and depressive symptoms for an interval of 3.5 years. We computed a series of two-step hierarchical regression analyses (separately for each indicator) to test the degree to which each indicator of a person × intervention-fit was predictive of happiness and depressive symptoms (criteria in the analyses) after 3.5 years, when controlling for the respective pretest scores. In the first step of the analysis, we entered the pretest scores of either happiness or depressive symptoms, to control for the respective initial levels ("pretest"). In the second step, we entered the variable of interest. Results (for the second step) are shown in Table 2.

Insert Table 2 about here

Table 2 shows that the more the participants liked the intervention and the more personal benefit they perceived from the intervention, the higher their happiness scores were at the follow-up after 3.5 years, when controlling for the pretest scores. Continued practice predicted the scores in happiness and depressive symptoms after 3.5 years. Participants who conducted the assigned intervention as instructed (or did more than instructed) had higher scores in happiness 3.5 years after the intervention than participants who did less than instructed, while the time they spent for the completion of the intervention did not predict happiness. Results revealed that early reactivity was predictive for increases in happiness (changes in the AHI) and reductions in depressive symptoms (changes in the CES-D). The incremental contribution of the predictors (above and beyond their initial levels) ranged between 1% and 7%.

For a more in-depth analysis we tested the predictive power for all indicators in one joint analysis (step 1 = scores from the respective pretests; step 2 = indicators of a person × intervention-fit, method: enter); performed separately for well-being and depression (see Table 3). When we entered all predictors in a joint regression analysis, they explained 6%

additional variance above the pretest scores in happiness after 3.5 years, and 10% additional variance beyond the pretest scores in depressive symptoms. For happiness and depression, only continued practice, and early reactivity (i.e., early reactivity in happiness or depression, respectively) remained significant predictors.

Insert Table 3 about here

In this study, we are interested in long-term effects, but the present data also allow for testing outcomes for shorter time spans. When conducting the hierarchical regression analyses with the same specifications as for the 3.5-year follow-up for the other measurement periods (posttest, follow-ups after 1-, 3-, and 6-months) highly similar results were found. In short, all predictors together explained between 4% and 11% in the variance of happiness and between 3% and 9% in the variance of depression above and beyond the pretest scores. The results are not shown in detail, but are available in the supplementary material online.

Discussion

This study lends further support to the notion that indicators of a person × intervention-fit in positive interventions such as (voluntary) continued practice, effort (conducting the intervention as instructed), preference (liking and perceived benefit), and early reactivity in happiness predict long-term changes in happiness, whereas continued practice and early reactivity in depression predicted long-term changes in depression. We found that all indicators together predict up to 6% in the variance of happiness and 10% in the variance of depressive symptoms 3.5 years after the completion of one out of nine positive psychology interventions. Hence, the *how* of conducting a short-term intervention (usually one- or two-weeks of exercise) predicts well-being and depression over longer time periods. The size of the coefficients (6 and 10%, respectively) can be considered large, given the long time span between the measurement time points. The main message from these analyses is

that the way people *think* about positive psychology interventions, the way they *work* with them, and the way they *react* to them, plays a role in predicting well-being at a later point in time—even with respect to a comparatively long time span of about 3.5 years after completion of the intervention. It should also be mentioned that findings were highly similar when analyzing shorter measurement time points; i.e., the posttest and follow-ups after 1-, 3-, and 6-months. Hence, the pattern of predictive value for the variables was stable across the measurement time points and the same indicators seem to be relevant for the prediction of short- and long-term changes in happiness and depression.

One might further argue that these three components (how people think about interventions, how they work with them, and how they react to them) can be seen as indicators of a fit between the person and the intervention. This fit seems to further facilitate the beneficial effects of interventions (e.g., in terms of experienced positive emotions or shifting the perspective to more positive aspects in daily experiences) and may make it easier for participants to work with the respective intervention—even for a prolonged period of time.

The effect sizes for the predictive power of *single* indicators on well-being were small by conventional standards for some of the indicators; they ranged from $R^2 = .01$ for *benefit* to $R^2 = .07$ for *early reactivity in depressive symptoms*. However, they are comparable to the average effects of positive psychology interventions in increasing psychological well-being, subjective well-being, and ameliorating levels of depression when compared to a control group (e.g., Bolier et al., 2013; $R^2 = .01$, $R^2 = .03$, $R^2 = .01$), or the effect sizes of high-quality studies on psychotherapeutic treatment of depression in adults (e.g., Cuijpers, van Straten, Bohlmeijer, Hollon, & Andersson, 2010; $R^2 = .01$).

While there were small effects for most of the indicators, the predictive power of *early reactivity* in happiness (4%) and depression (7%) was rather strong. This supports earlier findings (Cohn & Fredrickson, 2010) on the pivotal importance of this indicator. Further work is needed on what this early reactivity truly indicates, i.e., whether it is a sole reflection of a

good fit between person and the intervention (e.g., high motivation and effort to achieve a positive change). One might also argue that early reactivity is a stable individual differences variable—in the sense of an ability to successfully integrate the skills learned by conducting a positive intervention. This would mean that participants who showed a fast response to the intervention would show the same fast response to other types of positive interventions. Future studies examining multiple interventions conducted sequentially might help answering which explanation applies best (for a further discussion see Cohn & Fredrickson, 2010). Also, a better understanding on how early reactivity can be facilitated will help design interventions in the future.

Contrary to the findings reported by Cohn and Fredrickson (2010), early reactivity was not related to continued practice in the present study. It might be, that using only weekly measures is not fine-grained enough to capture the whole effect of early reactivity, which in Cohn and Frederickson's (2010) study was assessed by daily emotion reports.

As expected, voluntary continued practice was also important (cf. Gander et al., 2013; Seligman et al., 2005; Sheldon & Lyubomirsky, 2006). As suggested by Lyubomirsky et al. (2005), prolonged practice of an intervention might be necessary in order to form a habit and incorporate the intervention into daily routine more easily (cf. James, 1899). This notion is also in line with findings by Proyer, Ruch, and Buschor (2013) who found that participants in an intervention that increased *self-regulation* (as a "byproduct" of the conducted positive interventions) showed robust increases in well-being in a 10-week positive psychology intervention program. The authors argued that the interventions require a certain amount of self-regulation from the participants in the execution and organization of the exercises and that this may also have had an effect. One might further argue that there is an interplay with Sheldon and Lyubomirsky's (2012) ideas on how *hedonic adaptation* can be prevented. Those people that voluntarily continue practicing with a given instruction for an intervention might have found ways to experience variety in their experiences and to personally appreciate the

experienced changes. On the other hand, there seems to be some kind of saturation point for specific interventions that oppose a further gain in well-being (e.g., Gander et al., 2013; Lyubomirsky et al., 2005). Of course, one might also argue that the increases in well-being are due to continued practice via Fredrickson's (1998) *broaden-and-build* theory of positive emotions. Thus, those that voluntarily continue practicing experience more positive emotions and this, in turn, helps building further resources that can serve as a buffer against adversities in the future. The present data does not allow commenting on the causes of these effects more thoroughly. In any case, it would be helpful to test daily measures of positive emotions in positive interventions in more detail.

The findings regarding the *effort* were mixed. As expected, participants who conducted the intervention as instructed reported higher levels of happiness than those who did less. However, there were no associations with depressive symptoms and the time participants invested in the intervention was unrelated to depressive symptoms and happiness. It needs to be considered that the participants themselves estimated the time spent conducting the intervention. Therefore, this variable is potentially prone to distortions. It would be desirable to have more exact estimates of the effort in future studies; e.g., by having ratings from knowledgeable others (*peer*-ratings), analyzing linguistic properties (i.e., word count) or having people rate the "productions" (e.g., gratitude letters) that people have been working on during the intervention, or assessing the working time more objectively (e.g., when participants log on and off to an online platform). Aside from the working time, other indicators might also be of relevance. For example, one might argue that the diligence with which the participants' work is of greater importance than the mere amount of time spent.

The findings for the *preference* for the interventions were also mixed. We found positive associations between preference (for both, liking and perceived benefit) and happiness, which is also in line with earlier findings (Schueller, 2010), but there was no relationship with depressive symptoms. Both indicators of the preference were also related to

the pretest levels of happiness; i.e., happier participants liked the interventions better and thought they benefitted more from them. However, the pretest levels did not fully account for the relation of preference to happiness 3.5 years after the completion of the intervention.

All indicators of a person × intervention-fit were related to the other indicators (except for early reactivity in depression and the time spent with the intervention) and some indicators (i.e., preference and early reactivity) were also related to the pretest levels of well-being. Thus, one might argue that they reflect different aspects of a person × intervention-fit and that they have mediating effects on each other. Further, it was concluded that those participants with higher pretest levels in well-being tend to like the assigned intervention better (and perceive more benefit from it), which makes them put more effort into the intervention, which, in turn, leads to stronger early increases in well-being that makes participants continue practicing voluntarily. Whereas this explanation seems plausible, it does not fully account for the findings since voluntary continued practice and early reactivity in well-being showed unique contributions in the prediction of well-being. These were not mediated by each other, the other indicators of a person x intervention-fit, or the pretest levels of well-being.

Implications for future intervention studies in positive psychology. The findings of the present study can be used to design and implement future interventions more effectively. This knowledge might also be relevant for practical applications, such as increasing intervention efficacy or arriving at an early estimate of prospective outcomes of an intervention. Better knowledge of the effects of indicators of a person × intervention-fit might for example be used for the assignment of persons to specific types of interventions. If a person does not show improvements in well-being or depressive symptoms at an early stage when doing an exercise, it could be more efficient, also in the long run, to continue with a different exercise. Also, if a person shows a preference for certain types of exercises, similar exercises could be assigned (cf. Schueller, 2010). Monitoring the effort people put into an exercise and the early reactivity in well-being might also serve as more "objective" indicators of a person ×

intervention-fit. The question arises on whether this can also be translated into workplace interventions. There is robust evidence that using ones so-called signature strengths (those most typical for oneself as a person) at the workplace is associated with a broad range of positive workplace indicators and seeing ones job as a calling (Harzer & Ruch, 2012). When applying interventions to train ones signature strengths at the work place, early reactivity, as an indicator for the effectiveness of the assigned intervention, might especially be valued by occupational psychologists and other occupational health professionals, as it allows using resources as effective as possible.

Limitations

This study has several limitations. Firstly, we used a quasi-experimental approach that does not allow for causal inferences. Thus, the fact that participants who liked the intervention or continued practicing are happier after 3.5 years could also be explained by other personality characteristics. Also, we assumed that the studied variables would be indicative of a person × intervention-fit, but did only consider outcome characteristics and not characteristics of the person or the intervention itself. However, these limitations would not invalidate the conclusions on the predictive power of the variables, which entered this study. Secondly, our sample consisted only of women. Thus far, no study has reported gender differences in the effectiveness of positive psychology interventions. Nevertheless, a replication with a gender-balanced sample may be desirable in the future. Despite avoiding sampling only “happiness-seekers”, by not mentioning possible effects on well-being in the advertisement for the study (see Gander et al., 2013), it can still be assumed that mainly participants who were interested in a change in their life participated (self-selection). Thirdly, due to small sample sizes, we were not able to compare the effects of the indicators of a person × intervention-fit between the interventions. In a future study, it would be interesting to examine those variables for each intervention separately. Fourthly, in the present study we examined the changes from pretest to a follow-up after 3.5 years. Future studies which

examine long-term effects of positive interventions should include multiple, equally spaced measurement periods (e.g., a follow-up after every year). Fifthly, the indicators of a person × intervention-fit that were considered in the present study are, of course, not exhaustive and several others might also be of importance. Additionally, some of these indicators (such as the indicators of effort) are based on self-reports only and are, therefore, prone to distortions. It would be desirable to assess these more objectively in future studies; e.g., by measuring the time spent on the website or assess the estimation on a daily basis instead of a total score at the end of the week to simplify the estimation for the participants and to reduce the possible error-proneness.

A common problem in online intervention studies is the high number of dropouts. In the present study, 70.5% of the participants who were invited to the 3.5 years follow-up did not complete this assignment. The dropout rate in the present study was comparable to other online studies (see Mitchell, Vella-Brodrick, & Klein, 2010)—even if these studies did not include follow-ups longer than a time period of six months. However, the dropout rates of the studies reported in Mitchell et al. (2010) and other positive psychology intervention studies cannot be directly compared to the present study, because only those participants were contacted again who completed all follow-ups up to the six month time point. It needs to be mentioned that a high dropout rate is not problematic per se, if the dropouts occur unsystematically. We found only marginally significant age differences between those who completed the follow-up and those who dropped out in this study, but we found no differences in other demographic variables. Even more importantly, there were no differences in happiness and depressive symptoms at baseline. Given the high stability of happiness and depressive symptoms, we have no reason to believe that participation in the follow-up varies according to the levels of happiness and depressive symptoms. It needs to be acknowledged, however, that other variables may have had an effect on the relationship (see e.g., Eysenbach, 2005) between the indicators of a person × intervention-fit and the well-being after 3.5 years.

Despite these limitations, the present study shows that several characteristics of *how* an intervention is conducted are highly relevant for the intervention outcomes, even in the long run; i.e., after about 3.5 years. Overall, the study lends further support to the notion that positive psychology interventions have great potential to contribute to sustainable changes in well-being.

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Table 1

Zero-Order Correlations Between Happiness and Depressive Symptoms at Pretest and at the 3.5-Year Follow-Up with Indicators of a Person × Intervention-Fit.

	AHI pretest	CES-D pretest	AHI 3.5-y	CES-D 3.5-y	Liking	Benefit	Continuation	Instruction	Time	Reactivity AHI
CES-D pretest	-.56***									
AHI 3.5-years	.70***	-.41***								
CES-D 3.5-years	-.43***	.37***	-.70***							
Preference-Liking	.23**	-.10	.29***	-.14						
Preference-Benefit	.21**	-.17*	.26***	-.15	.61***					
Continuation	.10	-.01	.22**	-.15	.20**	.06				
Effort-Instruction	.08	-.13	.17*	-.13	.34***	.34***	.22**			
Effort-Time	-.04	.07	-.05	.05	-.03	.10	-.07	.11		
Reactivity AHI	-.27***	.02	.00	-.03	.13	.25**	.09	.12	.07	
Reactivity CES-D	.20**	-.61***	.07	-.01	-.15	-.12	-.01	-.03	-.06	-.26***

Notes. $N = 165$. AHI = Authentic Happiness Inventory; CES-D: Center for Epidemiological Studies Depression Scale; Liking: How much participants liked the exercise (1 = not at all, 7 = very much); Benefit: How much participants subjectively benefitted from the exercise (1 = not at all, 7 = very much); Continuation = Continued practicing up to one, three, or six months; Instruction: Did less than instructed (=0) or did as much or more than instructed (=1); Time: Total amount of time spent with the exercise during the intervention week; Reactivity AHI / CES-D: Differences between the posttest and the pretest.

*$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed)

Table 2

Hierarchical Regression Analyses of Happiness and Depressive Symptoms at the 3.5-Year Follow-Up on Indicators of a Person × Intervention-Fit (Separately), Controlled for Baseline Scores.

		Regression (Step 2)			
		Happiness after 3.5 years		Depressive Symptoms after 3.5 years	
Indicators	*df*	ΔF	ΔR^2	ΔF	ΔR^2
Preference					
Liking	1, 162	5.45*	.02	2.13†	.02
Benefit	1, 162	4.40*	.01	1.53	.01
Continuation					
	1, 162	7.56**	.02	3.84*	.02
Effort					
Instruction	1, 162	3.96*	.01	1.15	.01
Time	1, 162	0.10	.00	0.10	.00
Early reactivity					
Reactivity AHI	1, 162	13.07***	.04	0.23	.00
Reactivity CES-D	1, 162	1.43	.01	15.30***	.07

Notes. $N = 165$. Liking: How much participants liked the exercise (1 = not at all, 7 = very much); Benefit: How much participants subjectively benefitted from the exercise (1 = not at all, 7 = very much); Continuation = Continued practicing up to one, three, or six months; Instruction: Did less than instructed (=0) or did as much or more than instructed (=1); Time: Total amount of time spent with the exercise during the intervention week; Reactivity AHI / CES-D: Differences between the posttest and the pretest in the Authentic Happiness Inventory and the Center for Epidemiological Studies Depression Scale, respectively.

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (one-tailed)

Table 3

Hierarchical Regressions of Happiness and Depressive Symptoms at the 3.5-Year Follow-Up on Indicators of a Person × Intervention-Fit (Enter-Method), Controlled for Baseline Scores.

		Hierarchical Regression					
		Happiness after 3.5 years			Depressive Symptoms after 3.5 years		
Predictors	*df*	ΔF	ΔR^2	*t*	ΔF	ΔR^2	*t*
Step 1:	1, 163	152.87***	.48		25.85***	.14	
Pretest				11.82***			6.14***
Step 2: Predictors	7, 156	3.10**	.06		2.83**	.10	
Preference-Liking				0.65			0.04
Preference-Benefit				0.30			-0.19
Continuation				1.97*			-1.84*
Effort-Instruction				0.73			-0.19
Effort-Time				-0.49			0.23
Reactivity AHI				2.72**			0.93
Reactivity CES-D				-0.27			3.73***

Notes. N = 165. Liking: How much participants liked the exercise (1 = not at all, 7 = very much); Preference-Benefit: How much participants subjectively benefitted from the exercise (1 = not at all, 7 = very much); Continuation = Continued practicing up to one, three, or six months; Effort-Instruction: Did less than instructed (=0) or did as much or more than instructed (=1); Effort-Time: Total amount of time spent with the exercise

during the intervention week; Reactivity AHI / CES-D: Differences between the posttest and the pretest in the Authentic Happiness Inventory and the Center for Epidemiological Studies Depression Scale, respectively.
†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (one-tailed)

Supplementary online material

Hierarchical Regression Analyses of Happiness and Depressive Symptoms at all Follow-Ups on Indicators of a Person × Intervention-Fit (Separately), Controlled for Baseline Scores.

	Posttest	1 month	3 months	6 months
	$\Delta F(1, 162)$	$\Delta F(1, 162)$	$\Delta F(1, 162)$	$\Delta F(1, 162)$
Happiness				
Liking	7.41**	1.71†	3.08*	0.25
Benefit	18.52***	4.57*	5.06*	2.67†
Continuation	2.43†	3.30*	9.30**	6.03*
Instruction	3.76*	1.00	1.77†	0.09
Time	0.63	0.09	1.47	0.72
Reactivity AHI	-	50.88***	31.63***	3.86*
Reactivity CES-D	8.22**	0.22	0.89	0.29
Total (R^2; df[7, 156])	.04***	.11***	.11***	.04†
Depression R^2				
Liking	12.25***	0.20	0.04	0.67
Benefit	14.46***	0.01	0.96	0.46
Continuation	0.12	1.08	1.05	1.43
Instruction	3.15*	0.19	0.57	1.00
Time	0.03	1.64	0.07	1.93†
Reactivity AHI	17.15***	2.26	2.12†	1.06
Reactivity CES-D	-	3.95*	9.83***	2.79*
Total (R^2; df[7, 156])	.09***	.03	.06†	.08*

Notes. $N = 165$. Liking: How much participants liked the exercise (1 = not at all, 7 = very much); Benefit: How much participants subjectively benefitted from the exercise (1 = not at all, 7 = very much); Continuation = Continued practicing up to one, three, or six months; Instruction: Did less than instructed (=0) or did as much or more than instructed (=1); Time: Total amount of time spent with the exercise during the intervention week; Reactivity AHI / CES-D: Differences between the posttest and the pretest in the Authentic Happiness Inventory and the Center for Epidemiological Studies Depression Scale, respectively.

†$p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$ (one-tailed)